

*Drymarchon corais* (Daudin)

F.G.S. V-2413, Stratum No. 3, Vero Beach, St. Lucie Co., Fla., 2 vertebrae.

F.G.S. V-3492, Stratum No. 3, Vero Beach, St. Lucie Co., Fla., 2 vertebrae.

A.M.N.H. 7172, Seminole, Pinellas Co., Fla., 42 vertebrae.

In addition to those recorded by Gilmore (1938), Indigo snakes have been found in the above localities.

*Coluber constrictor* Linné

F.G.S. V-2413, Stratum No. 3, Vero Beach, St. Lucie Co., Fla., 1 vertebra.

A.M.N.H. 7173, Seminole, Pinellas Co., Fla., 42 vertebrae.

*Lampropeltis doliata* (Linné)

A.M.N.H. 7174, Seminole, Pinellas Co., Fla., 3 vertebrae.

This species is distinguished from *Lampropeltis getulus* by the fact that the ridge lateral to the sub-centrum keel is narrow and straight in *L. doliata* and wide and bulging as it approaches the ball of the centrum in *L. getulus*.

*Lampropeltis getulus* (Linné)

F.G.S. V-2413, Stratum No. 3, Vero Beach, St. Lucie Co., Fla., 1 vertebra.

A.M.N.H. 7175, Seminole, Pinellas Co., Fla., 46 vertebrae.

A.M.N.H. 6772, "Allen Cave" near Lecanto, Lecanto Co., Fla., 1 vertebra.

U.S.N.M. 13678, 2 miles W. of Melbourne, Brevard Co., Fla., 1 damaged vertebra.

*Elaphe obsoleta* (Say)

A.M.N.H. 7176, Seminole, Pinellas Co., Fla., 11 vertebrae.

*Farancia abacura* (Holbrook)

A.M.N.H. 7177, Seminole, Pinellas Co., Fla., 5 vertebrae.

In *Farancia* vertebrae there is a slight sub-centrum keel and there is a thin area extending posterior-medially from the prezygapophyses. Hay (1917) recorded this species from the Pleistocene of Florida from Stratum No. 3, Vero Beach, though Gilmore (1938) doubted the record as he could not find Hay's specimen. The discovery of *Farancia* vertebrae from Seminole suggests that Hay's record is possibly correct.

*Pituophis melanoleuca* (Daudin)

F.G.S. V-1630, Stratum No. 3, Vero Beach, St. Lucie Co., Fla., 1 vertebra.

A.M.N.H. 7178, Seminole, Pinellas Co., Fla., 21 vertebrae.

*Natrix* sp.

F.G.S. V-4814, Wakulla Springs, Leon Co., Fla., 2 vertebrae.

F.G.S. V-1621, Stratum No. 2, Vero Beach, St. Lucie Co., Fla., 1 vertebra.

F.G.S. V-2455, Stratum No. 2, Vero Beach, St. Lucie Co., Fla., 1 vertebra.

F.G.S. V-2431, Stratum No. 3, Vero Beach, St. Lucie Co., Fla., 2 vertebrae.

A.M.N.H. 7179, Seminole, Pinellas Co., Fla., 13 vertebrae.

U.S.N.M. 13678, 2 miles W. of Melbourne, Brevard Co., Fla., 2 vertebrae.

These are not referred to species due to the lack of comparative material.

*Thamnophis* sp.

F.G.S. V-4814, Wakulla Springs, Leon Co., Fla., 2 vertebrae.

A.M.N.H. 7180, Seminole, Pinellas Co., Fla., 1 vertebra.

These are not referred to species due to the lack of comparative material and the fact that it is probably impossible to distinguish the species of *Thamnophis* on vertebral characters.

## Crotalidae

A summary of the fossil pit-viper material of North America will be presented elsewhere (Brattstrom, ms.). Most of the large Crotalids from Florida are *Crotalus adamanteus*. Occasionally specimens of *Agkistrodon piscivorus* are found (A.M.N.H. 6776). For reasons to be presented elsewhere the *Crotalus adamanteus* from the Pleistocene of Florida are to be described as a new subspecies; in addition a new fossil species of *Crotalus*, related to *C. adamanteus*, from Florida will be described. The following material is that which has come to light since Gilmore's work (1938).

*Crotalus adamanteus* Breauvois

- F.G.S. V-471, Florida, locality unknown, 1 vertebra.  
 F.G.S. V-472, Stratum, Vero Beach, St. Lucie Co., Fla., 1 vertebra.  
 F.G.S. V-2455, Stratum No. 2, Vero Beach, St. Lucie Co., Fla., 1 vertebra.  
 F.G.S. V-3472, Stratum No. 3, Vero Beach, St. Lucie Co., Fla., 1 vertebra.  
 F.G.S. V-2413, Stratum No. 3, Vero Beach, St. Lucie Co., Fla., 6 vertebrae.  
 F.G.S. V-3492, Stratum No. 3, Vero Beach, St. Lucie Co., Fla., 1 vertebra.  
 F.G.S. V-1630, Stratum No. 3, Vero Beach, St. Lucie Co., Fla., 1 vertebra.  
 A.M.N.H. 6776, Seminole, Pinellas Co., Fla., many vertebrae.  
 A.M.N.H. 6778, "Allen Cave" near Lecanto, Lecanto Co., Fla., 6 vertebrae.  
 A.M.N.H. 7514, Florida, locality unknown, 17 vertebrae.

*Crotalus* sp.

- A.M.N.H. 6772, "Allen Cave" near Lecanto, Lecanto Co., Fla., 2 vertebrae.

*Agkistrodon piscivorus* (Lacépède)

- A.M.N.H. 7181, Seminole, Pinellas Co., Fla., 4 vertebrae.

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# THE INFLUENCE OF CROTON OIL ON SKIN TUMORIGENESIS IN STRAIN C57 BROWN MICE <sup>1</sup>

MICHAEL KLEIN

Numerous skin tumors are induced in mice exposed to one application of a carcinogen when croton oil subsequently is painted on the skin (Berenblum and Shubik, 1947; Bielschowsky and Bullough, 1949; Klein, 1952; Mottram, 1944; Shubik, 1950). None are obtained, however, when croton oil alone is applied (Berenblum, 1941; Berenblum and Shubik, 1947; Klein, 1952). It has been observed also that one application of a low dose of carcinogen to mice of mixed strain (Berenblum and Shubik, 1947), Swiss strain (Berenblum and Shubik, 1949), and strain DBA (Klein, 1952) produces only an occasional skin tumor. In contrast to this, it has been reported that many tumors are produced in strain C57 brown mice with one application of the carcinogen methylcholanthrene (Mider and Morton, 1939). Since this suggested a greater susceptibility, it was decided to investigate the influence of croton oil on skin tumorigenesis in the latter strain. The effect of a single low dose of methylcholanthrene on skin tumorigenesis also was examined. Answers were sought to these questions: 1. Would continued application of croton oil alone to the skin of a more susceptible strain lead to the development of visible skin tumors? 2. Also, in view of the greater susceptibility of C57 brown mice to skin tumorigenesis following one painting with methylcholanthrene, would this enhance the promoting influence of croton oil and be reflected in the production of a higher incidence of benign as well as malignant skin tumors?

## MATERIALS AND METHODS

Seventy-five young adult male mice from strain C57BR|cd JAX were included in this study. All were maintained on Purina Laboratory Chow pellets and received tap water *ad libitum*. The mice were divided into 3 groups of 25 each, and treated as follows:

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<sup>1</sup> A contribution from the Cancer Research Laboratory, University of Florida, Gainesville, Florida.

This investigation was supported by a research grant from the Damon Runyon Memorial Fund.

Group I—Painted once with 0.5 per cent 20-methyl cholanthrene<sup>2</sup> in olive oil.

Group II—Painted twice weekly for 25 weeks with 5 per cent croton oil<sup>3</sup> in olive oil.

Group III—Painted once with MCA as in Group I. Two weeks thereafter, the mice were painted twice weekly for 25 weeks with croton oil as in Group II.

Solutions were applied to the nape of the neck with one stroke of a No. 3 camel-hair brush. Following painting with MCA, the mice were isolated one to a cage for several days to minimize loss of the compound through licking and rubbing. All animals were housed in metal cages in an air-conditioned room (temp. 76-78° F.) no more than 10 to a cage. The mice were examined weekly for skin tumors. Only those growths which persisted at least 2 weeks and attained a minimum size of 1 mm. were considered as tumors. Most of the latter grew slowly to a maximum diameter of 2 to 3 mm., and were maintained at that size or regressed. Although several tumors grew progressively and attained a height of 7 mm., none developed into a malignant tumor. All surviving mice were sacrificed 2 months following the last painting with croton oil.

TABLE I

Promoting Influence of Croton Oil on Skin Tumorigenesis in Strain C57 Brown Mice.

Groups	Treatment	Effective Total Mice <sup>1</sup>	Total Mice with Tumors	Tumor Incidence	Average Applications Croton Oil	Average Observation Period, All Mice
		number	number	%	number	days
I	MCA once -----	24	5	21	0	220
II	Croton oil repeatedly -----	20	0	0	46	203
III	MCA once + croton oil repeatedly -----	21	14	67	45	197

<sup>1</sup> Survivors at time of first tumor in experiment.

<sup>2</sup> m.p., 179-180° C., hereinafter referred to as MCA.

<sup>3</sup> Obtained from Fisher Scientific Company, Eimer and Amend, N. Y., N. Y.